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"THE MARINE ZOOLOGIST"

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Introductory Remarks

In last year's Vol. 1, No. 3, there was an interesting article on the living animals of cowries by two of our members, Mrs. Rutland and Mrs. Kerslake. In this part we have a further article on the same subject by Mr. McCamley, and the fact emerges that the animal of *Erronea caurica longior* Iredale is fairly stable in the colouring; the papillae are described as being thick and mostly branched. If any member or reader could supply a sketch of the exact size shape and style of these papillae, this cowrie would be authentically settled for all time.

Further information is required about living animals of any molluscs, especially volutes and cowries. If such information is accompanied by a sketch or painting, so much the better.

Members, friends and those interested in such zoological work are asked to contribute when possible.

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The Beauty of Living Molluscs

BY FRANK MCCAMLEY.

During my recent collecting trip, south of Gladstone in Queensland, I was most fortunate to observe various species of Cypraeidae in their live state. Members who have had this happy experience fully realise the attractive picture made when the animal's mantle is fully extended.

The following is a description of two different species of cowries and one volute.

GRATIADUSTA WALKERI CONTINENS

Cypraea walkeri Sowerby, Conch. Illus. pt. 5, F. 22, Oct. 26, 1832; Cat. p. 7, Nov. 9, *ex* Gray MS. Persian Gulf.

Gratiadusta walkeri continens Iredale, Australian Zoologist, viii, 28th June 1935, p. 127, pl. ix, figs. 2, a, b. Queensland.

Iredale (*loc. cit.*) remarks, "A subadult specimen, herewith figured, was dredged off Lindeman Island and the animal figured. Mr. Melbourne Ward describes it thus: 'Mantle transparent milk white, papillae few and very short . . . Tentacles . . . pale yellow . . . proboscis salmon pink' . . ."

Fully adult specimens taken alive by me revealed the animal to have a brilliant scarlet mantle, with a few bright yellow papillae. Foot red, the underfoot being of a lighter red, siphon red and light red tentacles. Eyes just a tiny black spot. Foot not extended beyond shell.

It has been observed that the colouring is seldom truly established in juvenile specimens, and it is believed that there is considerable variation in the adults of various species of Cypraeidae.

ERRONEA CAURICA.

Cypraea caurica Linne. Syst. Nat., 1758, xth ed., p. 723. No locality.

The mantle of this animal was a milky-white, mottled closely with brownish-grey with a number of fairly thick processes or papillae, mostly branched. The foot was a transparent milky-white, mottled with dark grey, giving a "pepper and salt" effect, and was extended as the animal moved, the underneath being transparent white. Siphon orange-pink, tentacles yellow and the eyes visible as mere black pin-spots.

Departing from this most interesting family, I would like to describe the lovely animal of *Voluta* (*Amoria*) *caroli* Iredale, also collected alive by me on this same collecting holiday.

The foot is opaque milky-cream and is well extended, about half an inch on either side and one and a half inches posteriorly when the animal crawls. This foot is brilliantly striped with rufous-tan on the dorsal surface. The underfoot is deep cream, the siphon tan. The tentacles are a light tan and the eyes are very tiny and a deep cream in colour.

When the animal was withdrawn into the shell, the aperture was filled with a most attractive mass of tan and cream stripes.

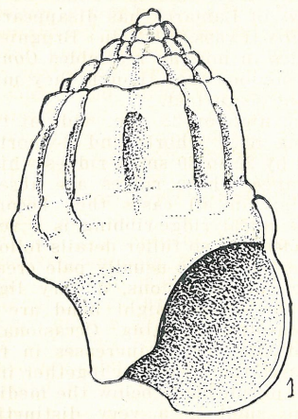
There is a great beauty in shells and added beauty in their animals. Truly they are one of the glories of nature.

A New Genus of the Nassariidae

BY C. F. AND J. LASERON.

AUSTRONASSARIA SIMPLEX, gen. et sp. nov.

An extreme or aberrant form of the Nassariidae characterized by a shell nearly cylindrical in mid-section, surmounted by a low, broadly conical spire of three whorls. The protoconch is small, of 1½ whorls, inflated, smooth, white and vitreous. Early whorls white, the body-whorl pale yellow with ochre in the interstices of the axial ribs.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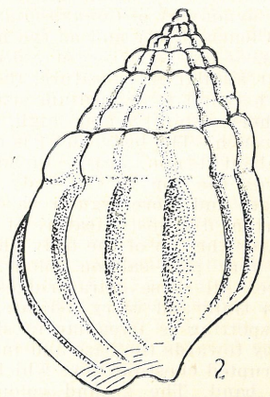
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Body-whorl nearly cylindrical above, swollen and rounded below. Sculpture of a few broad axial ribs, 12 to the whorl, separated by shallow interstices, and swelling above into broad, low bosses at the suture, and similarly below at the periphery. The whole of the base smooth and highly polished. Aperture relatively small, round, the outer margin thickened, smooth, inner margin regularly arcuate, also

smooth. Columella broad and smooth, obliquely arcuate adjoining the aperture. Canal broad, rounded, shallow and open. Length 10 mm., width 6.5 mm.

Locality.—6-9 fathoms, Sow and Pigs Reef, Port Jackson, New South Wales.

Remarks.—The unique and extraordinary form of this shell at first sight suggested some abnormality, and it was not until a second specimen was procured from the Queensland coast that the authors were satisfied that the novelty is definitely constant. The type was collected from material dredged by the "Triton" from the west channel at Sow and Pigs Reef, and there is no certainty of the depth below the harbour bed at which it was procured. This locality is very close to the east channel, where previous dredgings by the "Triton" procured so many strange, exotic molluscan types, some of which appear to be definitely extinct.

The type has been presented to the Australian Museum.

Notes on Australian Shells

No. 1

By Lee Woolacott.

Family CONIDAE.

Genus VIRROCONUS Iredale, 1930.

Virroconus imperator, *sp. nov.*

(Figure 3)

After much checking of literature and the study of a great number of cone shells, I have decided that the specimen here described is sufficiently distinct from any other cone to merit a name of its own. It is a very striking shell in appearance and would appear to have but one other which resembles it in any way, this is *Conus roseus* Lamarck, a West Indian Shell. As *roseus* of Lamarck has disappeared in the synonymy of *Conus regius cardinalis* Hwass, 1792 (in) Bruguiere (see Clench, 1942) and as the new species in no way resembles *Conus regius*, or any varieties of *regius*, it is obvious that though they may appear similar in literature, they are not so in fact.

The shell is of medium size, 40 mm. high by 25 mm. wide at the periphery. Spire 8 mm. high, consisting of 8 whorls and 2-whorled protoconch. The body-whorl is encircled by 22 to 30 small ridges which are about 1 mm. apart. In some instances these ridges are absent towards the top of the body whorl, but in all cases they become stronger and more regular basally. The spiral ridge-ribbing is a very important diagnostic feature of this species and so fuller details follow. Towards the top of the body-whorl these ridges are usually pale cream or a very pale salmon colour, and on rare occasions, a very light mauve. All these spiral ridges above the median light band are of pastel tints and carry delicate, small chestnut spotting. Occasionally this spotting is irregular in shape and size, but it increases in frequency towards the base and in many cases the spots run together into interrupted chestnut lines which become purple-black below the median light band. The ground colour of the shell is a very distinctive pinkish-brown, most evident in slightly worn specimens. The ground colour deepens through red-brown to purple-black at the base, and at no period is there any touch of yellow. The yellow-browns of *Virroconus lividus* and its near relations separate them into quite a different colour group. The median light coloured band is about 2/10 in. wide, of a bluish-mauve or very light salmon-pink. The spire is neat, of 8

whorls, each whorl bearing about 12 cream-white nodules of medium dimensions. Between these nodules are rich patches of colour varying from a dark chestnut to purple-black, forming an almost continuous line on the body whorl but broken up into "pits" on the earlier spire whorls. The three apical whorls and the protoconch are light salmon-pink. Sculpture on the spire whorls consists of three rather weak spiral ridges to each whorl faintly crossed by rather obsolete growth striae. The periostracum is thick, strong, somewhat coarse and of a dark brown colour. A small colony of these cones was found at Trinity Bay, Queensland in August 1949.

Holotype presented to the Australian Museum, Reg. No. 61858.

Paratypes from Trinity Bay, 10 in my possession; from Fitzroy Island, Queensland, 1 in Mrs. Kerslake's collection and 1 in mine.

Family NATICIDAE.

Genus NATICARIUS Dumeril, 1806.

Naticarius lavendula sp. nov.

(Figures 1 & 4)

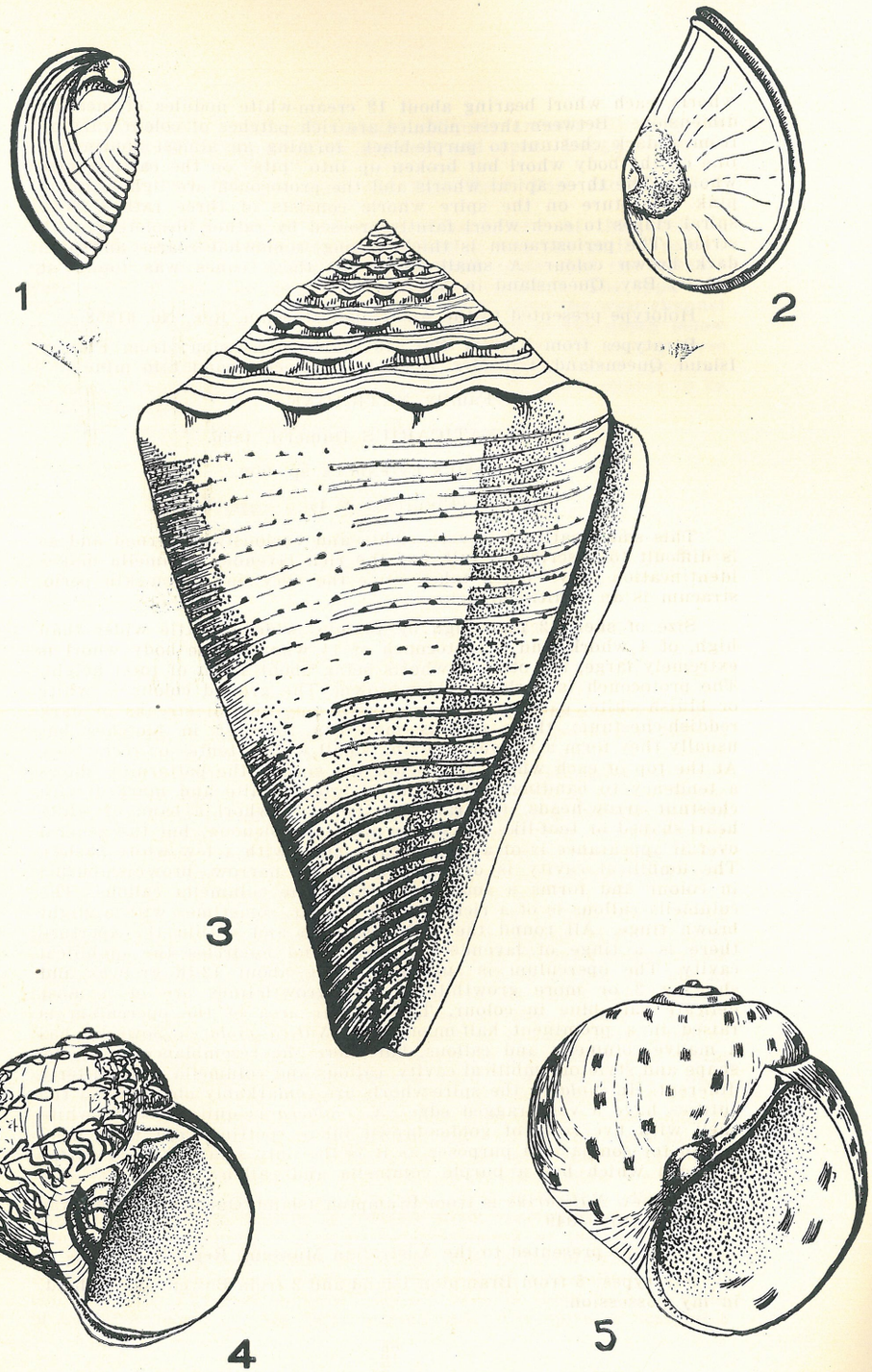
This small naticoid is very richly and variously patterned and so is difficult to describe in full, but the rich lavender columella makes identification easy. When taken alive the very fine onion-skin periostracum is an additional help.

Size of shell 12 mm. high by 15 mm. wide. A little wider than high, of 4 whorls and a protoconch of 1½ whorls. The body whorl is extremely large, the other 3 whorls being about 1/6th of total height. The protoconch is a clear golden-brown. The ground colour is white or bluish-white, patterned all over with longitudinal streaks of dark reddish-chestnut; these streaks may run together in blotches but usually they form a network leaving small white "tents" or rectangles. At the top of each whorl, just below the suture, the patterning shows a tendency to banding. This band is broad, white and marked with chestnut arrow-heads. Centrally on the body whorl a band of white heart-shaped or tent-like patches is quite conspicuous; but the general overall appearance is of a small brown shell with a few white flashes. The umbilical cavity is of medium length, narrow, brownish-purple in colour and forms a small pit behind the columella callous. The columella callous is of a rich lavender colour, sometimes with a slight brown tinge. All round the umbilical area and within the aperture there is a tinge of lavender. A pale band encircles the umbilical cavity. The operculum is sulcate, bearing about 12-16 grooves and showing 2 or more growth-lines. The growth-lines are of a most delicate pale blue in colour. The nuclear area of the operculum is raised in a prominent half-moon boss. *Natica violacea* Sowerby has a mauve columella and callous, but there the resemblance ends, the shape and style of umbilical cavity, callous and columella being utterly different. In *violacea* the spire-whorls are remarkably obscure and the sutures have a very ragged edge. *N. violacea* is quite a solid, white shell with five rows of golden-brown lunar spotting, and it is mentioned for comparison purposes as it is the only small naticoid so far recorded which has a purple columella and callous.

The new *Naticarius* is from Brampton Island, Queensland, and was found in July 1949.

Holotype presented to the Australian Museum, Reg. No. 61859.

Paratypes: 5 from Brampton Island and 3 from Bowen, Queensland, in my possession.



Delin. Lee Woolacott.

See page 75 for Explanation of Plate.

NOTOCOCHLIS LUCULENTUS (Iredale).

(Figures 2 & 5)

An illustration of *Natica luculenta* Iredale appeared in the Records of the Australian Museum XVII, Sept. 4, 1929, p. 179, pl. xl, fig. 10. It is not always possible to obtain these Records today, and as the operculum was unknown at that time, a short description with an illustration of the shell and the operculum, Figs. 2 and 5, is given here to assist collectors.

So far as I know the shell is rare and from deep water; the holotype from 50-60 fathoms off Montague Island, N.S.W., and my specimen, alive, was trawled in 40 fathoms off Botany Bay and measured 18 mm. x 16 mm., smaller than the original. The shell is thin, very globose, of 6 whorls. The ground colour is cream and there are numerous rows of small chestnut splashes. The umbilical cavity is half-moon shaped with a small central boss arising from the very thin and narrow columella. A thin callous glaze extends to the outer lip. The operculum is thin and cream in colour, showing regular, very fine growth striae. At the nuclear area it is slightly roughened and sunken. The outer edge which fits against the outer lip is bent upwards at the first deep groove and is further slightly inclined at the second groove. This upward flange makes a very tight fit within the aperture. The opercular characters show that this small Naticoid should be placed under the genus *Notocochlis*.

I wish to thank Mrs. V. Rooke for a long series of Cones from Fitzroy Island Queensland, also Mr. T. Iredale for his assistance and advice.

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EXPLANATION OF PLATE.

1. *Naticarius lavendula*. Operculum x 2.
2. *Notocochlis luculentus*. Operculum x 2.
3. *Virroconus imperator*. Type x 2.
4. *Naticarius lavendula* x 2.
5. *Notocochlis luculentus* x 2.

A Northern Australian Volute

By Tom Iredale.

Mr. Melbourne Ward collected a quantity of shells, beach material, at Boucaut Bay, eastern side of the mouth of the Liverpool River, Mid Arnhem Land, North Australia. This material inculded many valves of two bivalves, whose facies was unfamiliar, and these proved to be representatives of two groups, not previously recognised among the large collections made on the north-eastern coast of Australia. It is known that Torres Strait divides two distinct faunulas, that of the west being known as the Dampierian Region, a subdivision of the Solanderian Regon. The latter eastern faunula is further subdivided into the Solanderian Province, restricted, and the Banksian Province. All are sections of the huge Indo-Pacific Area, the Solanderian showing more affinity with the Pacific forms, the Dampierian leaning to the Indian section, but forming quite a distinctive minor subsection. The Volutes of the Dampierian are intriguing as there is a group *Amoria* which is well represented by a number of closely related species, well defined, but suggesting only subspecific status. There are other groups of Volutes also, such as *Cymbiola, Aulica* and *Volutoconus*. These were indicated by Hedley (Proc. Linn. Soc. N.S.W., Vol. xxxix, p. 723, 1915), the first named including *nivosa* and its associates, the second *flavicans* with its allies, the last named having as type *coniformis*, to which *bednalli* was allotted, probably incorrectly. The species here dealt with would come under *Aulica*, of which *aulica* is the type. Many dead specimens were in the Boucaut Bay material, and these were recognised as the form, known locally as *tissotiana*, a rare species. Upon checking this name a curious history was disclosed. In 1867, Crosse (Journ. de Conch, Vol. xv, p. 195, pl. VI, fig. 1, April) had described the species, without definite locality, but stated that the type had been a long time in the collection of M. de Robillard, of Mauritius, whence it had recently passed into the possession of M. Tissot, after whom it was named. Apparently the locality was Mauritius or the neighbourhood, but certainly not Northern Australia, which at that time was quite inaccessible. The acceptance of the name *tissotiana*, was due to Brazier, who wrote to Crosse, that specimens had been collected near the Liverpool River, Arnhem Land, during the expedition into that territory by Captain Cadell. Crosse reported this identification (made by Brazier from the figure only) (Journ. de Conch, Vol. xix, p. 297, Oct., 1871) and it has been accepted since. There has been doubt as specimens in the Australian Museum from the North Alligator River had been identified as *mariaemma*, and others from north-west Australia as *flavicans* var *signifer*. The last named had been described by Broderip (Proc. Zool. Soc. (Lond.) 1847, p. 232) from the Ind. Oceano orientale? from the Cuming Collection received from Dr. Dalen of Rotterdam, said to have come from the East Indies. The Volute, named *mariaemma* by Gray (Proc. Zool. Soc. (Lond.) 1859, p. 230, pl. 48) came from Singapore, and was renamed *grayae* by Crosse (Journ. de Conch, Vol. xix, p. 287, 1871) who objected to the name selected by Gray on grounds of purism only. This seems to be a different species. However the Australian specimens while having a superficial resemblance to the Mauritius *tissotiana* do not completely agree, and moreover *signifer* would seem to have priority as well as locality preference. Cotton (Rec. South Aust. Mus., Vol. ix, pp. 181-196, pls. xiii-xvi, May 31, 1949) published some notes on the Australian Recent and Tertiary Volutes and figures *tissotina* (sic) from North Australia, commenting "*Cymbiola scafa* and *C. tissotina* are probably nodular and smooth forms of the same species," figuring *scafa* on pl. xiii, fig. (7) and *tissotina* on pl. xiii, fig. (2). The numerous

specimens of the smooth shell, so far, have never shown any signs of intergradation, and may be regarded as a distinct species which may be named.

Aulica quaesita, sp. nov.

The shell is of medium size, stout, spire medium, about half the breadth, smooth with four strong plicae. Coloration of a dead shell is whitish, but the living shell is cream, marked with red brown, a row of blotches below the suture, irregular markings in an interrupted band about the middle of the whorl, a similar band of red streaks lower. The type is the larger specimen figured, the smaller figure is of a more boldly marked younger shell. There are four adult whorls, succeeding a flattened apical tip of about three smooth whorls, the initial tip very small. The whorls are gently rounded, sutures marked, the body-whorl comprising the bulk of the shell. The aperture is about three-quarters the length of the shell, at first narrowly oval with the outer lip thin, then broadening, the outer lip expanding and thickening, the canal broad, open. Outer lip sinuate posteriorly, semi-canaliculate. Inner lip slight. Length 82 mm.; breadth 45 mm.; spire 22 mm.

Holotype and paratype in the Australian Museum, Sydney.

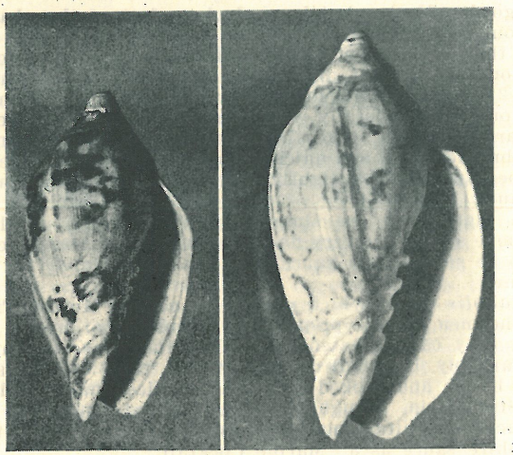

Figure 1.—*Aulica quaesita* Iredale. Left, paratype; right, holotype, from Boucaut Bay, Northern Territory.

G. C. Clutton photo.

An Octopus Delicacy and Other Marine Tidbits

By Phillip Colman.

Recently, whilst cleaning some shell "finds," I thought it a great waste to throw such good sea-food away, and decided that, from now on, I would look forward to shell-collecting, not only for the Cabinet but for the Kitchen as well.

Below are the results.

OCTOPUS AU CASSEROLE.

Ingredients:—

3 medium-sized octopuses
6 large abalone (*Notohaliotis ruber*)
Sufficient mashed potatoes, plus chopped parsley, to cover dish
Pulp of 4 tomatoes
Onion, thyme, small amount of carrot
1 fresh mullet
Butter sauce

Method: Clean well and pressure-cook octopuses for 6-7 minutes, after which the skin and suckers will readily scrape clean with a knife. Slice about one-tenth of an inch thick and beat until nearly pulp. (Special metal meat tenderising mallets may be bought which are very good.) Next cut, trim and clean foot of the abalones, slice into 4-5 round wafers and beat well.

Place the prepared octopuses, half the abalones, the tomato pulp, sliced onion, thyme, salt and pepper in casserole dish and simmer for about 2½ hours in a moderate oven, adding water when necessary.

Take out, cover liberally with mashed potatoes and brown. While potatoes are browning, take the other half of the abalones, roll in milk and breadcrumbs, and quickly brown in hot fat. Place these over the potatoes and sprinkle lightly with milk, then place back in oven for a minute.

While ingredients are simmering, pressure-cook mullet for five minutes, bone and mince very finely. Add to the butter sauce and heat. This is to be served as a sauce with the casserole. Truly a dish for the gourmet.

Notohaliotis ruber, which used to be called "Mutton Fish" by old N.S.W. fishermen, can be prepared in a number of ways. Although a bit tough, they can be eaten raw, when they have, to my palate, a taste remarkably like boiled eggs. Again, they can be sliced thin, dipped in batter and cooked like fish; or diced finely and cooked as fritters. Still again, though they have to be tenderised first, they can be placed in white sauce like oysters, or served with tomato and worcestershire sauce as a "Marine Cocktail."

The common sand "pipi," *Plebidonax deltoides*, is another mollusc which goes well with a white sauce. It can also be made into a "clam" chowder, using potato as the thickening agent.

Verco, in his book "Combing the Southern Seas" says, "Scallops eaten with pepper, salt and vinegar are exquisite. Put in a lid on top of the stove, they die almost at once and the valves open. Then they stew in the salt water already contained in the shell, until it is nearly all exhausted, when they are taken off, the mantle removed (for this is rather thin and tough), and they are eaten hot with a little pepper and vinegar" . . . By substituting Pipi for Scallop, ignoring the remark about removing the mantle, but otherwise following instructions, I found a very nice fish dish awaiting me.

All shell-fish make good soup-stock, even the water that periwinkles have been boiled in may be used this way.

This is as far as I have gone, but I feel that I have only just touched the fringe of what can be done to bring our molluscs to the Australian table.

Most shell-fish are edible, though a little discrimination may be used and nothing should be eaten from polluted waters. The "look" of certain molluscs may be misleading, but there is one that I don't think I will ever be able to eat, and that is the Umbrella shell, *Umbraculum botanicum*.

The Wedding Whirl of the Soldier-Fish

Soldier-fishes of the genus *Apogon* and allied genera carry their eggs in their mouths, a phenomenon known as "oral gestation" or "buccal incubation." Some other fishes do this too: certain catfishes, the burramundi (*Scleropages*) and the mouth-breeders well known to aquarists. This peculiar habit in a soldier-fish, *Apogon guentheri* (now *Vincentia novaehollandiae*) was first discovered in Sydney by J. D. Ogilby who, in November 1888, exhibited before the Linnean Society of New South Wales a fish "whose mouth was crammed with ova, suggesting the possibility of this species having contracted the habit . . . of hatching out the ova in the pharynx . . ."

It is only recently that the method of reproduction and incubation has been studied from life, in the case of a European species, *Apogon imberbis*, by Garnaud (Bull. Inst. Oceanogr. 977, 1950, pp. 1-10, figs. 1-7) at Monaco. One of Garnaud's figures is slightly modified here and his account, which should be enjoyed in the original French, is condensed thus:

The fishes' "ronde nuptiale" proceeded as follows. Two fish turn slowly, side by side, the male, at the interior of the circle, slightly "unwedged" in front. The sides of the body are tightly pressed together, blocking the internal pectoral fins. The rotation is anti-clockwise. The left ventral fin of the female is fully extended as a spout under the genital pore of the male. The anal fin of the male, spread horizontally, vibrates rapidly under the genital pore of the female, which is greatly distended and projecting. (Figs. 1a and 1b).

This manoeuvre may last nearly a minute and ends with a vibration of all the body in both fishes. No eggs are laid in the course of this nuptial pirouette, contrary to all expectation. By this device, it appears that there is internal fertilization, something which represents an unique case in bony fishes. The milt, collected at its origin by the ventral fin of the female, thence conducted and disseminated under the belly of the female by the vibrating anal fin of the male, suffices to impregnate the roe.

These couplings are renewed a few times or not at all, over several days. They seem to become less ardent. In a little while the female continually hunts the male and encourages him, with determination, to repeat the former circlings without interruption. The male submits and seems to produce more of a self-control than a sustained ardour. The couple furiously chase anything approaching, immediately to resume their more and more frequent circlings. Such a pertinacity, some little "hallucination," sufficiently indicates that something happens to produce the unexpectedly sudden transmission of the eggs.

All of a sudden, the female ejects the complete mass of her eggs, which the male immediately gulps into his mouth. But this compact and voluminous mass of eggs is difficult to settle in the expanded mouth-cavity of the male. He works it into shape, quickly, returns it, coughs it up and gulps it without desisting for a moment. This hard work takes long minutes, during which, with his head turned at an angle he must defend himself from the attacks of other, obviously attracted, fishes.

The female defends him energetically and does her best to chase the curious ones. Finally the male *Apogon* has installed his brood in a convenient fashion and regains all his composure. He resumes his accustomed station, in company with the female, now rid of her eggs.

The sudden delivery of the egg-mass to the male—seized greedily, like long-coveted prey—confirms the internal fertilization, observed at the moment of the nuptial circling.

Apogons carrying eggs are commonly christened "pelicans." They are easily recognisable by the alteration of their profile.

Garnaud goes on to say how the breathing of the "pelican" oxygenates the eggs, and that the fish does not feed during his incubating. About the seventh day the male gets rid of the eggs, whose attachments are destroyed, and the embryos develop in the discarded and now broken mass of eggs. The male then resumes feeding, but if another female comes along he will accept another batch of eggs from her, and there is a possibility of many successive breedings.

It seems likely that Australian Apogonidae may have similar breeding habits and any observations on such fishes would be worth reporting.

G. P. Whitley.

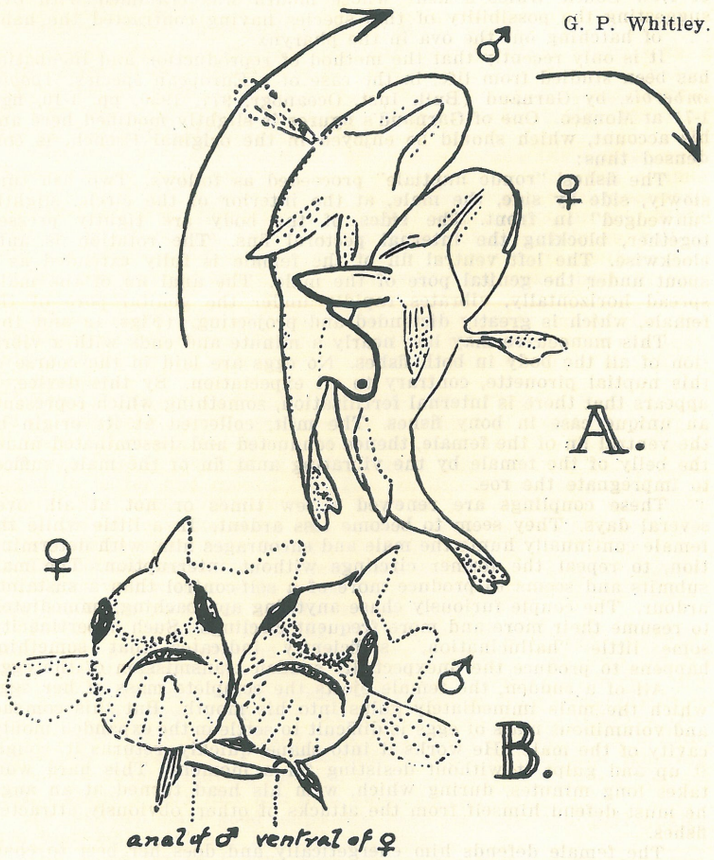

Figure 1.—The wedding whirl of the European Soldier-fish, *Apogon imberbis*. A, from below; B, from the front.
Modified from Garnaud.

History of New South Wales Shells
Part 1: Cook and His Associates

By Tom Iredale.

Captain James Cook, R.N., F.R.S. (1728-1779)
A medallion in old Wedgwood ware

[Block by courtesy of the Australian Museum, Sydney]

As generations pass into history so do the beginnings become fainter and more indistinct, but with the advent of printing, human knowledge became crystallized and, fortunately, numerous records were made which have survived. Australia is not so fortunate as Europe in the possession of these old records, although many relating to our own early history are preserved in several of our libraries, and from these we may now begin to build up a chronological history. It is regrettable, but true, that in less than two hundred years it has become difficult to present a clear picture, in part owing to our separation from the early culture of the northern world, and partly to inadequate records.

The earliest Europeans to visit this land reached our western shore and, it is to be presumed, were too busy to collect shells with any idea of their study. Whatever they may have taken back to their northern homes is now entirely lost to recognition.

Of the European visitors to the west, the best known are the Dutch who examined the whole of the western area from the Gulf of Carpentaria in the north to Nuyts Archipelago in the southern Great Australian Bight, calling all that portion of Australia "New Holland," which was later used to include the east coast as well.

The Englishman Dampier, who visited western Australia at the end of the seventeenth century, may have collected shells, but as no mention has been made of such in any accounts of his travels, the possibility may be ignored.

The history of Australian shells, therefore, can truly be said to begin with Cook's famous first voyage, and as he first landed at Botany Bay, New South Wales, in 1770, this State has the honour of its shells being the first made known to the scientific world.

Captain James Cook was a great navigator but he was not a naturalist. He was interested, in the present case, because he had on board the *Endeavour* two great naturalists, Mr. (afterwards Sir)

Joseph Banks and Dr. Daniel Solander. Both these gentlemen were keen botanists, Solander being also a general naturalist.

Banks was a wealthy young man who made the trip at his own expense and, consequently, his collections were his own property.

Solander was a favourite pupil of Linne (the great lawgiver of the scientific world) and had an excellent knowledge of botany, birds, shells and other animals large and small. He was the paid tutor, assistant and friend of Banks, and to him are due all the notes on animal life, though these have been credited to Banks and even to Cook.

Discussing the findings of the day in their cabin, Cook and probably also Cook's "writer" (the name used for a secretary in those days) were present, and recorded the naturalists' results in the "log" or report to the Admiralty. This log has become famous and is known as "Captain Cook's Journal." Two, three or more copies were made of the journal under Cook's instructions. Cook had to furnish a report to the Admiralty at the first opportunity of forwarding it, in this case, when he came to Batavia.

In the earliest copy no name was given to "Botany Bay," but in the second copy "Stingray Bay" appears, and this name is given on the earliest charts. Later a change was made to Botanist's Bay and later still the alteration to the world-famous Botany Bay took place. It must be remembered that the clean, corrected copies of the log were made in London after the voyage had been completed.

Cook's companions made collections of shells in the area now known as Botany Bay, but owing to the fact that these place names, as also that of New South Wales, were unborn at that date, the habitats of these first-collected New South Wales shells appear in contemporary literature as New Holland, South Seas or Isles of the Pacific, or even New Zealand. New Zealand had been visited earlier and had been named and probably some similarity in the sound of the name caused confusion or maybe to the stout and trusty mariners of those days New Zealand was "close" enough to Australia as to make no difference.

Some of the officers and men of the *Endeavour*, parrot-like, collected shells and sold them on their return, and these commonly had no locality save South Seas. Soon after the *Endeavour* reached England quite a number of specimens went to the Continent, and these were illustrated in large books on shells.

In Cook's journal there are a few remarks which cast a very interesting sidelight on the shells of Botany Bay, as follows:—"There were six canoes and six small fires near the shore, and Muscles roasting upon them, and a few oysters laying near." Again:—"There were small fires and fresh Muscles broiling upon them; here likewise lay vast heaps of the largest Oyster Shells I ever saw." Further:—"In the morning I had sent Mr. Gore, with a boat, up to the head of the Bay to drudge for Oysters." And this very discerning statement, "On the sand and mudbanks are Oysters, Muscles, Cockles etc., which I believe are the chief support of its inhabitants."

It may be as well to note here that the aborigines were great shell collectors, but solely for food. Those tribes which lived near or visited the sea shores have left memorials of their feasts in huge accumulations of broken and burnt shells which are known as "kitchen middens"; a name used in the Northern hemisphere for the rubbish tips adjacent to the houses. Investigating the aborigines' middens it is seen that no selection of shell life was made save in size. Any shell animal was consumed if it were large enough to be worth breaking, and such small items as "periwinkles" (favourites in Europe) were completely ignored.

Banks' collections, with the exception of his botanical specimens, were distributed as he willed, being his private property. At that time

the British Museum was in its infancy, but there were several private museums belonging to the aristocracy which were of great importance, and to these private museums went most of the Banksian treasures.

Hence, to find the fruits of the Botany Bay collections, it is necessary to search through the records of these private museums. We are assisted in this by the learned Dr. Solander who was very interested in shells and was using the Duchess of Portland's magnificent collection. The Duchess of Portland had accumulated a wonderful museum which was sold by auction upon her death, but what we are concerned with most is that a very important and comprehensive catalogue of the contents was issued prior to the sale in 1787. In this catalogue the shells are named from Solander's MS., which was never published, though it is fortunate that, in order to make these names intelligible to the would-be purchasers, references and figures were cited in some cases. These Solander names were made use of by many writers and became common property, although, of course, they have no value until determined by some later usage.

An English artist named Martyn was so taken by the beauty of shells brought back from Cook's voyage that when he published his "Picture Book of Shells" he included several very beautiful paintings of them. Martyn devised a new scheme which was arranged as an index only, but here again, through misadventure, and despite the fact that one hundred and sixty plates were issued, the new scheme was not adequately developed and only the index, full of errors and inconsistencies, was given to the public. For some years the names appearing in his index were accepted, but more recently they have been rejected, apparently quite correctly. In the main, this is of little account as Martyn's names were mostly used by Gmelin in his revised edition of Linne's Systema Naturae and so not all were lost and Martyn's glorious paintings will always be referred to with great pleasure by conchologists.

An English dealer by the name of Humphrey or Humphries secured many shells from someone who had been on Cook's ship, and these were sold to collectors on the Continent, such as Spengler. Martini described specimens from Spengler's collection, also some articles were written about these shells in a periodical called *Die Naturforscher* published in Halle, Germany. From all the foregoing sources it is possible to draw up a small but recognisable list of shells collected by Cook's associates, as follows:—

Oyster, Rock, *Saxostrea commercialis* (Ired. & Roughley).
Oyster, Mud, *Ostrea angasi* Sowerby.
Sydney Cockle, *Anadara trapezia* (Deshayes).
Mussel, *Mytilus obscurus* Dunker.
Mussel, Hairy, *Trichomya hirsuta* (Lamarck).
Sea Ear, *Haliotis ruber* Leach.
Noddiwink, *Nodilittorina tuberculata* (Menke).
Conniewink, *Bembicium melanostoma* (Gmelin).
Sydney Whelk, *Pyrazus ebeninus* (Bruguiere).
Cart-rut shell, *Dicathais orbita* (Gmelin).
Bubble Shell, *Bullaria botanica* Hedley.
Sydney Turban, *Ninella torquata* (Gmelin), formerly *Ninella staminea* (Martyn).
Warrener, *Subninella undulata* (Martyn), formerly *anguis* (Gmelin).
Australwink, *Austrocochlea obtusa* (Dillwyn).